U.S. Department Of Energy
Hanford Site, Richland, Washington

DOE Project Managers and Contacts: Mr. R. D. Doug Hildebrand (509) 373-9626 and Mr. John G. Morse (509) 376-0057 DOE/RL contract DE-RP06-03-RL14432

The Hanford Environmental Information System (HEIS) is one of the well-organized databases and contains all chemical monitoring data since the 1950's. Chemicals monitored at the Hanford site cover a wide spectrum of individual substances, matrices, and complex mixtures, including hazardous organic compounds, metals, and radionuclides. There are more 600 chemicals in the HEIS database. Total numbers of chemical records are approximately 2.5 million records of about 900 water quality-monitoring wells.

Processed by:

EnviroDataAccess technology is one of the recent advanced technologies **developed under U.S. DOE Small Business Innovative Research (SBIR)** program by Consultants For Environmental System Technologies (CFEST, Inc),
10 Damara Street, Irvine, CA 92614 (949) 474 4558

Most of the chemical data is in tabular form. DOE site contractors, regulators, and other data users spend hours to repeatedly extract partial information to understand and use the available information. **EnviroDataAccess technology** eliminates need for data extraction and plotting by the individual HEIS data user. Following are some key highlights of **EnviroDataAccess technology** forma and hyperlinks.

- Chemicals monitored at Hanford site have been grouped into 9 chemical categories: GENCHEM, PHYSICAL, METALS, ORGANIC, PESTICIDES, RADIONUCLIDES, SEMIVOLATILES and VOLATILES.
- **EnviroDataAccess** generates chemical data summary tables for the entire site as well as by subsites. Each chemical data row of the summary table includes information on total data, total number of detects, concentration ranges, and sampling durations. These summary tables can be sorted on the internet by clicking on any column heading.
- **CAS#** (first column of the summary table) is hyperlinked to the EPA web site for chemical properties and regulation descriptions.
- **Chemical Names** are hyperlinked to each well summary table of the given chemical**. DATA** column of summary table is hyperlinked to entire dataset of the given chemical in the subsite.
- **Well names** in chemical well summaries are linked to a chemical plot and well details for the given well.
- **Concise Informative Displays** include well location, rainfall, water level, geology, well construction details and plots of all chemicals monitored at a well
- **Groundwater level** plots provide all historical water level plots with well construction details and well location map.
- **Dynamic chemical summary** provides real time generation and extraction of data for a sub-site by user defined time duration and chemical category.

In summary, **EnviroDataAccess technology** supports massive numbers of users, is cost-efficient and provides information in real-time; and uses centralized data, thus providing the latest accurate information. **EnviroDataAccess technology** uses are user-friendly and novice users/public can navigate through each key component of environmental data. **EnviroDataAccess technologies** meet stringent requirements for security, administration, and maintenance and is in line with major global trends for Internet-based data access and processing. **EnviroDataAccess technology** output uses do not need licenses to process and access summary tables, data, and plotted information.

Following are some of **EnviroDataAccess technology** output of HEIS database.

EnviroDataAccess

Environmental Data Access in Real Time.

U.S. D.O.E. Hanford Site Data

HEIS Chemical Data can be accessed using any of the following options:

ALL WELLS	GROUNDWATER OPERABLE UNITS (1951-2002)	RCRA TSD Sites (1951-2002)	
Data-all	100-BC-5	100-KE-KW	ERDF
All Chemical Summary	100-KR-4	1301-N	LLWMA-3
	100-NR-2	1324-N-NA	LLWMA-4
WELL SERIES (1951-2002)	100-HR-3-D	1325-N	LLWMA-1
WELLSERIES-0-99	100-HR-3-H	183-H	LLWMA-2
WELLSERIES-199	100-FR-3	200-TEDF	NRDWL
WELLSERIES-299	200-BP-5	216-A-29	PUREX-CRIBS
WELLSERIES-399-499	200-PO-1	216-B3-1	SALDS
WELLSERIES-699	200-UP-1	216-B63	SWL
WELLSERIES-1199-3099	200-ZP-1	216-S-10	WMA-A-AX-
All Others	300-FF-5	316-5	WMA-B-BX-BY
	1100-EM-1	400-PROCESS-PONDS	WMA-C
		WMA-U	WMA-S-SX

http://www.envirodataaccess.com/heis2002_htm/hanford-subsets.htm

Table 1: EnviroDataAccess provides efficient means to view chemical data by “All Wells”, “Well Series”, “Groundwater Operable Units”, and “RCRA TSD Sites”.

Selecting any hyperlink in above URL provides options to view:

- Chemical data summaries in any of the eight categories (See Table 3).
- Well Plots by selecting the Well Plot option (See Table 6).

Chemical summary tables are by the following chemical category links:

Genchem	Organic	SemiVolatiles
Physical	Pesticides	Volatiles
Metals	RadioNuclides	

Each Chemical Summary Table Provides: List of Chemicals, Number of Data Points, Number of detects, Number of wells, Minimum & Maximum Concentration, First & Last Sampling Date, & links to more detailed information.

To view **all Chemicals plotted** for each well:

Well Plot Summary

The Well Plot Summary contains a table of all wells in this site and the number of data points and detects for each chemical group. From this table, just click on the well name for a link to the Well Plot.

http://www.envirodataaccess.com/heis2002_htm/100-bc-5.htm

Table 2: Click on any of the above chemical groups for a “Chemical Summary Table” for the chosen site to be displayed.

EnviroDataAccess “Chemical Summary Table” (Table 3) provides list a of Chemicals, Number of Data Points, Number of detects, Number of wells, Minimum & Maximum Concentration, First & Last Sampling Date, & links to

- Each well summary for the selected chemical in the subsite (by clicking on well number)
- Each Chemical has an animation of concentration over time (by clicking on chemical name)
- All data for the given chemical (by clicking of data column),
- Hyperlink to EPA website for the selected chemical (by clicking on CAS#). Other chemical reference links can be found by clicking on the Chemical Hazards links in the upper right hand corner of the table.

Table 3 includes other details. Click on Column Details for a description of column headers like CAS#, Con Long Name, etc.. Click on Chemical Hazards to go to a list of different sites that contain more information on all of the chemicals listed.

DOE HANFORD SITE GROUNDWATER CHEMICAL DATA RADIONUCLIDE SUMMARY TABLE — ChemicalHazards

GWOU_SITE=100-BC-5: Data from1951 to 2003 FileCreatedOn=04/16/2003 Column Details Help

CAS#	CON LONG NAME	UNIT	DATA	DETECTS	WELLS	CONC MIN	CONC MAX	1st DATE	Last DATE
ALPHAHI	Alpha_UNFIL	pCi/L	22	9	16	-0.43	3.	04/13/1989	03/12/1990
14596-10-2	Americium-241_UNFIL	pCi/L	94	5	25	-0.03	1.	07/18/1992	04/29/1993
14234-35-6	Antimony-125_UNFIL	pCi/L	33	26	22	-23.20	27.	08/23/1991	01/14/2002
14798-08-4	Barium-140_UNFIL	pCi/L	4	0	3	-10.00	50.	07/21/1992	04/27/1993
13966-02-4	Beryllium-7_UNFIL	pCi/L	16	4	11	-15.70	100.	08/23/1991	01/14/2002
C14 PMC	Carbon-14 percent modern carbon_UNFIL	PMC	1	1	1	689.70	690.	08/22/1994	08/22/1994
14762-75-5	Carbon-14_UNFIL	pCi/L	236	97	26	-130.00	410.	07/18/1992	10/20/1995
13967-74-3	Cerium-141_UNFIL	pCi/L	5	0	4	-5.30	50.	07/21/1992	04/27/1993
14762-78-8	Cerium-144_UNFIL	pCi/L	31	0	25	-17.00	70.	07/21/1992	04/29/1993
CE/PR-144	Cerium/Praseodymium-144_UNFIL	pCi/L	4	4	4	-37.80	1.	08/23/1991	09/18/1991
13967-70-9	Cesium-134_UNFIL	pCi/L	123	4	28	-7.64	20.	08/23/1991	01/14/2002
10045-97-3	Cesium-137_UNFIL	pCi/L	249	42	38	-11.40	39.	10/01/1975	01/14/2002

http://www.envirodataaccess.com/heis2002_htm/100-BC-5/rad/rad_sum.htm

Table 3: An example of a radionuclide summary for a selected site from Table2.

Click on any of the column headers to sort the data by that column value. Following contains descriptions of Column links for each chemical on Figure 1 and Tables 4 and 5.

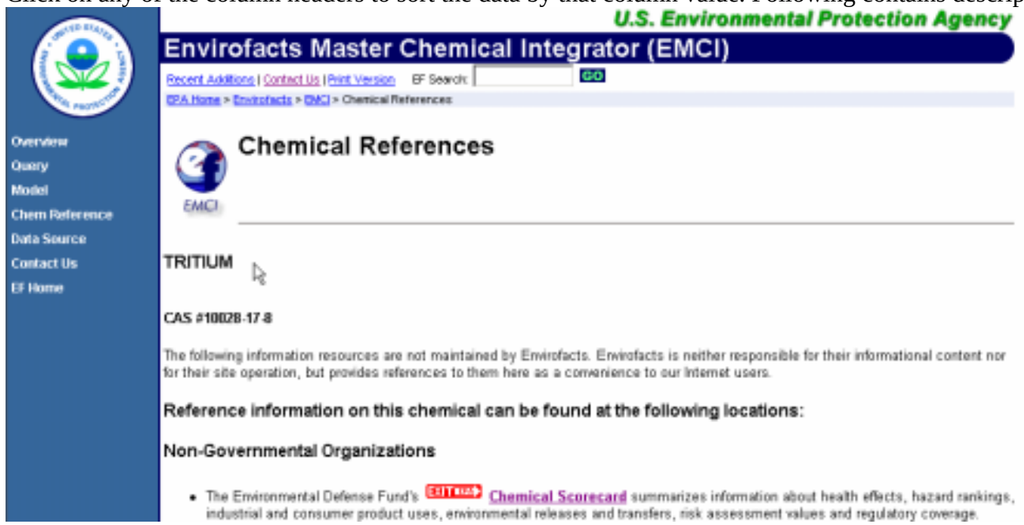
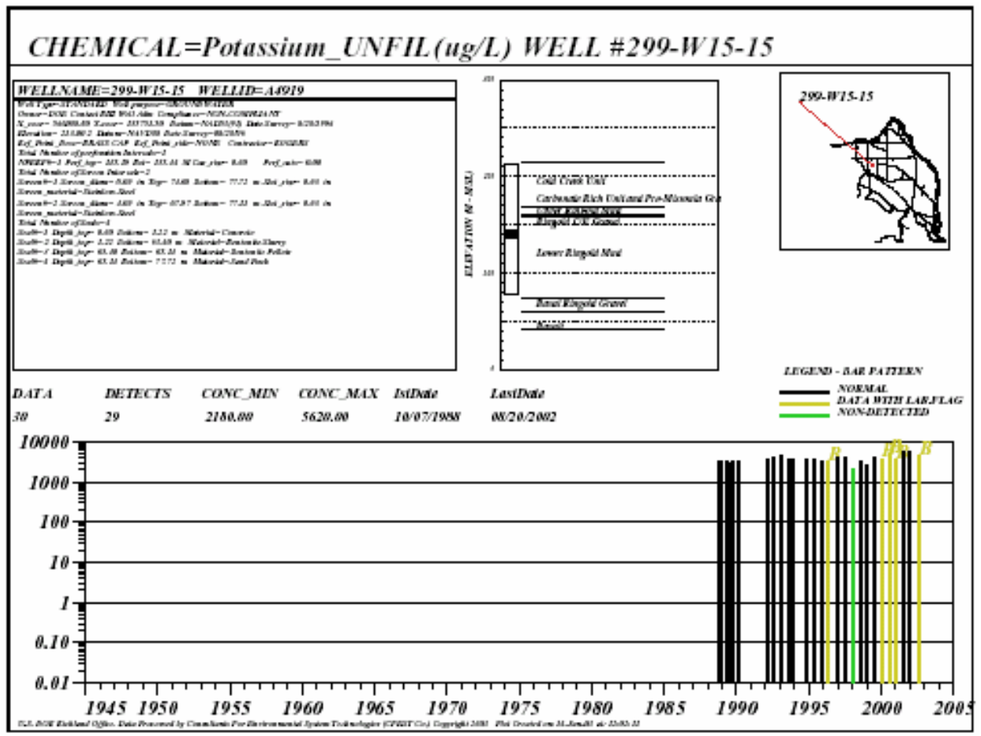


Figure 1: Clicking on the CAS# in an All Chemical Summary Table (Table 3) brings up the EPA Chemical Reference for that chemical. Some CAS#’s don’t have links because there is no chemical reference for them.

WELL SUMMARY TABLE FOR CHEMICAL=Tritium(pCi/L) CAS#=10028-17-8						
WELL_SERIES=wellseries-100-199: Data from1951 to 2002 FileCreatedOn=11/24/2002 Column Details						
WELLNAME	DATA	DETECT	CONC_MIN	CONC_MAX	FIRSTDATE	LASTDATE
199-B2-12	17	1	-124.0000	280.0000	07/20/1992	01/03/2002
199-B2-13	14	14	3880.0000	15000.0000	07/19/1992	01/07/2002
199-B3-1	53	53	840.0000	70100.0000	11/27/1974	01/31/2002
199-B3-2	1	1	1400.0000	1400.0000	04/02/1976	04/02/1976
199-B3-2P	22	17	24.3000	1400.0000	04/02/1976	06/10/1997
199-B3-2Q	20	19	0.5900	3100.0000	04/02/1976	06/11/1997
199-B3-46	16	16	3900.0000	8000.0000	07/18/1992	01/03/2002
199-B3-47	17	17	3850.0000	88100.0000	07/18/1992	01/07/2002
199-B4-1	56	56	1300.0000	130000.0000	04/28/1977	04/05/1999
199-B4-2	45	45	1100.0000	37000.0000	03/05/1979	01/25/1995
199-B4-3	45	45	1300.0000	190000.0000	10/01/1975	11/17/1994

http://www.envirodataaccess.com/heis2002_htm/WELLSERIES-100-199/rad/rad_sum/Tritium_sum.htm

Table 4: Clicking on the Well Number in an All Chemical Summary Table (Table 3) brings up a Well Summary Table for the Chemical. Each Well Summary contains a list of Wells in the subsite. For each well the Number of Data and Detects, Concentration Minimum and Maximum, and First and Last Sampling Date is listed. More information can be obtained about each well and the chemical at that well by clicking on that well's "wellname" (See Figure 2).



http://www.envirodataaccess.com/chemeach/707_0738.pdf

Figure 2: Well and chemical information brought up by clicking on the wellname in the tables.

CHEMICAL=Americium-241(pCi/L) CAS#=14596-10-2									
WELL_SERIES=wellseries-100-199: Data from1951 to 2002 FileCreatedOn=11/24/2002 Column Details									
Mean= 0.0231 Median= 0.0040 Standard Deviation= 0.2388									
Wellname	Date	Std_rptd_value	Value_rptd	Flag	V_qual	Std_count_err	StdMda	StdTotAnaErr	DectMinActiv
199-B2-12	07/20/1992	-0.0100	-0.0100	U	None	0.015	0.000	0.000	0.000
199-B2-12	10/19/1992	0.0110	0.0110	U	None	0.017	0.020	0.000	0.000
199-B2-12	01/19/1993	-0.0060	-0.0060	U	None	0.024	0.040	0.000	0.000
199-B2-12	04/17/1993	0.0090	0.0090	U	None	0.017	0.030	0.000	0.000
199-B2-13	07/19/1992	-0.0120	-0.0120	U	None	0.012	0.000	0.000	0.000
199-B2-13	10/22/1992	0.0090	0.0090	U	None	0.024	0.050	0.000	0.000
199-B2-13	01/23/1993	0.0050	0.0050	U	None	0.015	0.030	0.000	0.000
199-B3-1	07/25/1992	0.0060	0.0060	U	None	0.018	0.000	0.000	0.000

http://www.envirodataaccess.com/heis2002_htm/100-BC-5/rad/rad_txt/Americium-241.htm

Table 5: Clicking on the Data Value in an All Chemical Summary Table (Table 3) brings up a chemical summary for that chemical. Each Chemical Summary shows all measured values of that chemical in the subsite. Each measure value includes the wellname the value came from, the date, the std_rptd_value, value_rptd, Flag, Std_count_err (for Rad's), StdMda, StdTotAnaErr, and DetectMinActiv. The column details link here has details about these values. Also available in the header is the statistical Mean, Median, and Standard Deviation for all Data in this Chemical Summary.

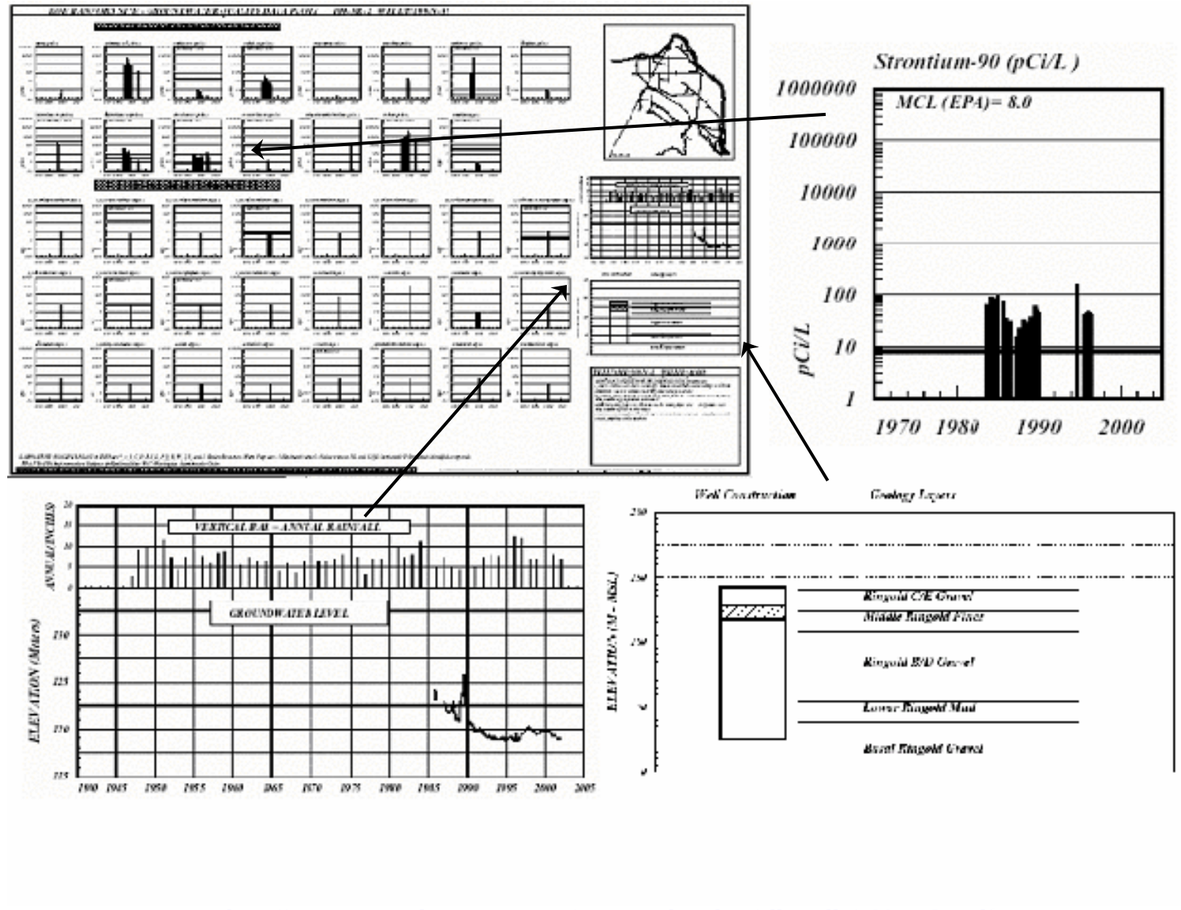
From any hyperlink in Table 1 select your site, then click on the Well Plot Summary in Table 2. This provides options to view **Water Quality Data Plots** with location map, rainfall, water level, geology, and other data.

Well Chemical Summary Table (e.g., Table 6) includes list of wells within the selected site. For each well, number of observations for each chemical category are also listed in the well summary table.

WELL CHEMICAL SUMMARY TABLE FOR SITE=wellseries-100-199													
Black values represent number of data values measured. Red values are the number of data points above the detectable limit.													
WELLNAME	Radio-nuclide		Volatiles		Semi-Volatiles		Pesticides		Metals & PhysParm		GenChem & Org		Sampling Date First	Sampling Date Last
166-D-1	0	0	0	0	0	0	6	6	0	0	0	0	11/13/2000	11/13/2000
166-D-2	0	0	0	0	0	0	7	7	0	0	0	0	11/13/2000	11/13/2000
199-B2-12	169	58	100	3	256	20	879	519	222	0	196	140	04/23/1992	01/03/2002
199-B2-13	133	53	0	0	0	0	0	0	0	0	0	0	07/19/1992	01/07/2002
199-B3-1	275	189	318	13	307	15	982	510	222	14	323	224	06/01/1955	01/31/2002
199-B3-2	30	30	0	0	0	0	15	15	0	0	20	20	06/01/1955	01/11/1980
199-B3-2P	49	39	0	0	0	0	87	71	0	0	78	66	04/02/1976	06/10/1997
199-B3-2Q	31	28	0	0	0	0	33	23	0	0	48	38	04/02/1976	06/11/1997
199-B3-46	171	91	215	21	256	63	792	428	224	56	206	153	07/18/1992	01/03/2002

http://www.envirodataaccess.com/waterqualityplots/100-bc-5/100-BC-5_well.htm

Table 6: An example of the Well Plot Summary Table. Each table summarizes for each chemical group, the number of data values (black) and number of values above the detectable limit (red) for that well. As well as the first and last sampling dates. Click on a WELLNAME to see the Well Plots for that particular well.



http://www.envirodataaccess.com/waterqualityplots/all_wells/199-N-31.pdf

Figure 3: Clicking on a WELLNAME from the Well Chemical Summary Table (Table 6) will give you a PDF image that plots all chemicals for a given well and pertinent well and site information. An advantage of pdf is that you can zoom in on any sections of the file.